CLAIMS

1. A substrate (1), especially a glass substrate, coated with at least one dielectric thin-film layer deposited by sputtering, especially magnetically enhanced sputtering and preferably reactive sputtering in the presence of oxygen and/or nitrogen, with exposure to at least one ion beam (3) coming from an ion source (4), characterized in that said dielectric layer exposed to the ion beam has a refractive index that can be adjusted according to parameters of the ion source, said ion source being a linear source.

2. The substrate (1) as claimed in claim 1, characterized in that the density of the dielectric layer deposited on the substrate by sputtering with exposure to the ion beam is maintained.

3. The substrate (1) as claimed in claim 1 or claim 2, characterized in that the dielectric layer exposed to the ion beam has a refractive index close to the index of a layer deposited without an ion beam.

4. The substrate (1) as claimed in any one of the preceding claims, characterized in that the dielectric layer exposed to the ion beam has a refractive index greater than the index of a layer deposited without an ion beam.

5. The substrate (1) as claimed in any one of claims 1 to 3, characterized in that the dielectric layer exposed to the ion beam has a refractive index less than the index of a layer deposited without an ion beam.

6. The substrate (1) as claimed in any one of the preceding claims, characterized in that said layer has an index gradient adjusted according to parameters of the ion source layer.

7. The substrate (1) as claimed in any one of the preceding claims, characterized in that said dielectric layer is made of a metal oxide or silicon oxide, whether stoichiometric or nonstoichiometric, or made of a metal nitride or oxynitride or silicon nitride or oxynitride.

8. The substrate (1) as claimed in any one of claims 1 to 7, characterized in that said dielectric layer is made of an oxide of at least one element taken from silicon, zinc, tantalum, titanium, tin, aluminum, zirconium, niobium, indium, cerium, and tungsten.

9. The substrate (1) as claimed in claim 8, characterized in that the layer is made of zinc oxide and has a refractive index of less than or equal to 1.95, especially of 1.85 to 1.95.

10. The substrate (1) as claimed in claim 8 or 9, characterized in that the layer is made of zinc oxide and has a density of around 5.3 g/cm^3.

11. The substrate (1) as claimed in any one of claims 1 to 7, characterized in that said dielectric layer is made of silicon nitride or oxynitride.

12. The substrate (1) as claimed in any one of the preceding claims, characterized in that said layer has an argon content of around 0.2 to 0.6 at%.

13. The substrate (1) as claimed in any one of the preceding claims, characterized in that said layer has an iron content of less than or equal to 3 at%.

14. The substrate (1) as claimed in any one of the preceding claims, characterized in that it is coated with a multilayer in which a silver layer is placed on top of said dielectric layer exposed to the ion beam.

15. The substrate (1) as claimed in claim 14, characterized in that another dielectric layer is placed on top of the silver layer.

16. The substrate (1) as claimed in claim 14 or 15, characterized in that the multilayer includes at least two silver layers.

17. The substrate (1) as claimed in any one of claims 14 to 16, characterized in that it has a surface resistance $R_\square$ of less than 6 $\Omega / \square$, or even less than 2.1 $\Omega / \square$, especially around 1.9 $\Omega / \square$.

18. A glazing assembly and especially a double-glazing or laminated glazing assembly, comprising at least one substrate (1) as claimed in any one of the preceding claims.

19. A process for deposition on a substrate (1), in which at least one dielectric thin-film layer is deposited on the substrate by sputtering, especially magnetically enhanced sputtering and preferably reactive sputtering in the presence of oxygen and/or nitrogen, in a sputtering chamber (2), with exposure to at least one ion beam (3) coming from an ion source (4), characterized in that an ion beam is created in the sputtering chamber using a linear source and in that the refractive index of said dielectric layer exposed to the ion beam can be adjusted according to parameters of the ion source.

20. The process as claimed in claim 19, characterized in that an oxygen ion beam is created.

21. The process as claimed in claim 19 or 20, characterized in that an ion beam is created with an energy of between 200 and 2000 eV, or even between 500 and 5000 eV.

22. The process as claimed in any one of claims 19 to 21, characterized in that the density of the dielectric layer deposited on the substrate by sputtering with exposure to the ion beam is preserved.

23. The process as claimed in any one of claims 19 to 22, characterized in that the refractive index of the dielectric layer exposed to the ion beam is lowered relative to the index of this layer deposited without the ion beam.

24. The process as claimed in any one of claims 19 to 22, characterized in that the refractive index of the dielectric layer exposed to the ion beam is increased relative to the index of this layer deposited without the ion beam.

25. The process as claimed in any one of claims 19 to 24, characterized in that exposure to an ion beam takes place simultaneously with the deposition of the layer by sputtering.

26. The process as claimed in any one of claims 19 to 25, characterized in that exposure to an ion beam takes place sequentially after the layer has been deposited by sputtering.

27. The process as claimed in any one of claims 19 to 26, characterized in that an ion beam is directed onto the substrate (1), especially along a direction making a nonzero angle with the surface of the substrate, preferably along a direction making an angle of 10 to 80° with the surface of the substrate.

28. The process as claimed in any one of claims 19 to 27, characterized in that an ion beam is directed onto at least one cathode, especially along a direction making a nonzero angle with the surface of the cathode, preferably along a direction making an angle of 10 to 80° with the surface of this cathode.

29. The process as claimed in any one of claims 19 to 28, characterized in that the dielectric layer is based on zinc oxide.

30. The process as claimed in any one of claims 19 to 29, characterized in that an ion beam (3) is created in the sputtering chamber (2) from a linear ion source (4) simultaneously with the deposition of the layer by sputtering and in that the deposited layer then undergoes an additional treatment with at least one other ion beam.

31. An installation (10) for deposition on a substrate (1), especially a glass substrate, for the manufacture of the substrate as claimed in any one of claims 1 to 17 or for the implementation of the process as claimed in any one of claims 19 to 30, which includes a sputtering chamber (2) in which at least one dielectric thin-film layer is deposited on the substrate by sputtering, especially magnetically enhanced sputtering and preferably reactive sputtering in the presence of oxygen and/or nitrogen, with exposure to at least one ion beam (3), characterized in that it includes, in the sputtering chamber (2) at least one linear ion source (4) capable of creating at least one ion beam.

32. The installation (10) as claimed in the preceding claim, characterized in that a linear ion source is placed so as to direct an ion beam onto the substrate, especially along a direction making a nonzero angle, preferably an angle of 10 to 80°, with the surface of the substrate.

33. The installation (10) as claimed in claim 31 or 32, characterized in that a linear ion source is placed so as to direct an ion beam onto at least one cathode, especially along a direction making a nonzero angle, preferably of 10 to 80°, with the surface of this cathode.